

THE UNIVERSITY OF KANSAS SCIENCE BULLETIN

VOL. XXVIII]

MAY 15, 1942

[No. 6

Some Geckoes of the Genus *Phyllodactylus*

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ABSTRACT: The members of the genus *Phyllodactylus* occurring in Mexico are discussed. Three new species are described as follows: *Phyllodactylus bordai* from near Taxco, Guerrero, Mexico; *Phyllodactylus magnus* from Tierra Colorado, Guerrero, Mexico; *Phyllodactylus darwini*, Chatham Id., Galápagos Islands. The Central American species *Phyllodactylus ventralis* O'Shaughnessy, the South American *Phyllodactylus reissi* Peters, and the Mexican *Phyllodactylus unctus* (Cope) are discussed. All specimens are figured.

MUCH of the older literature dealing with the genus *Phyllodactylus* in Mexico and Central America is confused, owing to the fact that most specimens reported upon have rather indiscriminately been referred to *Phyllodactylus tuberculosus* Wiegmann.

This species was described by Wiegmann in a section devoted to "Amphibien" in "Beiträge zur Zoologie, gesammelt auf einer Reise um de Erde" by J. J. F. Meyen, Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol., 17 (1) 1835, pp. 241-242, pl. 18, figs. 2, 2a. The work deals with the reptiles and amphibians of the "Reise," but this species purporting to have originated in "Californien" seems quite out of place, since the itinerary of the Reise passed no closer to California than the Galápagos Islands or Honolulu. The type locality "Californien" has been understood to refer to Baja California since a large, tubercled species does occur there.

Cope (1863) described two species from peninsular Mexico. One *Diplodactylus unctus*, a species well differentiated from *Phyllodactylus tuberculosus* by the absence of trihedral tubercles on the back, was described as having a snout to vent length of 4.5 inches (110 mm.). The other species was named *Phyllodactylus xanti*, a species having large tubercles on the back. This species was referred to the

synonymy of *P. tuberculosus* by O'Shaughnessy (1875) and there it has remained.

Hobart M. Smith (1935) recognized in the Mexican *Phyllodactylus* which we had together collected in Mexico, two species of the genus neither of which resembled *P. tuberculosus* Wiegmann sufficiently to be regarded as the same species. These he named *P. homolepidurus*, type locality, "five miles southwest of Hermosillo, Sonora," and *P. lanei*, type locality, Tierra Colorada, Guerrero.

Smith in his paper suggested that there was no certainty that *P. tuberculosus* Wiegmann actually came from "California." The following year W. Mosauer (1936) described a species *Phyllodactylus delcampi* with the type locality Tierra Colorada, Guerrero. He expresses the opinion that there should be no question as to the type locality of *tuberculosus* and suggests that it might have been purchased "preserved in a bottle from a sailor." He erroneously places *P. lanei* in the synonymy of *P. tuberculosus* apparently on the strength of a specimen in his possession so labeled. He mentions "great variability" in *P. tuberculosus*, which strongly suggests that he had more than a single species so labeled. Mosauer's opinion should be given no more credence than those expressed by Smith, since he saw no specimen unquestionably *P. tuberculosus*. Until the type of the Wiegmann species is rediscovered and studied by a competent person, there will be doubt as to which form must bear the name *tuberculosus*. Even then the matter may not be settled, since the type has a regenerated tail and the characters of the original tail are pertinent in defining the species of the genus.

Recently (Taylor, 1940) I described two other species of the genus. These were *Phyllodactylus muralis* from Totolapam, Oaxaca, and *P. magnatuberculatus* from Acapulco, Guerrero.

The EHT-HMS collection of *Phyllodactylus* now numbers about 250 specimens. The identified specimens in the collection are referred to the following forms:

- 30 specimens *Phyllodactylus homolepidurus* Smith
- 58 specimens *Phyllodactylus muralis* Taylor
- 96 specimens *Phyllodactylus lanei* Smith
- 4 specimens *Phyllodactylus bordai* sp. nov.
- 21 specimens *Phyllodactylus delcampi* Mosauer
- 21 specimens *Phyllodactylus magnus* sp. nov.
- 1 specimen *Phyllodactylus magnatuberculatus* Taylor

In this paper I describe two new species from Mexico and a third from Chatham Island, Galápagos Islands. The last species has been identified previously as *P. tuberculosus*.

I am not aware that any lacertilian species has such a distribution as has been attributed to *Phyllodactylus tuberculosus* (California to Peru) without the aid of man. Wide distribution occurs in domestic geckoes, such as *Peropus mutilatus* and *Hemidactylus frenatus*, but so far as I know no evidence has been marshalled to prove that *P. "tuberculosus"* is a species of this sort. I do not doubt that still other undescribed forms occur in Mexico, some of these already in museum collections, masquerading under the name *tuberculosus*.

The status of certain Phyllodactyli in California, Baja California, and the islands of the west coast of Mexico must remain in doubt until further study can be made. Two names are to be reckoned with—*Phyllodactylus xanti* and *Phyllodactylus tuberculosus*, both belonging to the group having the large tubercles on the back, and presumably enlarged tubercles on the tails.

At least one undescribed form is known to occur, this on Isla Sta. Margarita, off the west coast, and doubtless others occur elsewhere. These forms are to be treated in another paper.

A species from an unknown locality, *Phyllodactylus mentalis* Werner (Jahrb. Hamburg Wiss. Anstalt., 27 (2), 1910, pp. 4-5) described from a poorly preserved specimen that had apparently "died in captivity and was greatly emaciated" cannot be associated with any known Mexican species with certainty. Mosauer (1936) adds a few details to this description.

Phyllodactylus bordai sp. nov.

(Fig. 1)

Type.—EHT-HMS No. 27732, collected about six miles north of Taxco, Guerrero, Mexico, under rock, at an elevation of about 5,600 ft., August 26, 1941, by E. H. Taylor.

Paratypes.—EHT-HMS Nos. 10997, 6 Km. south of Taxco, Guerrero, July 17, 1936; 21808, near Agua Bendita, Guerrero, August 27, 1939; 27733, topotype.

Diagnosis.—Less than eighteen scales between middle of orbits exclusive of scales on eyelids; sixteen more or less irregular rows of trihedral tubercles; tail covered with regular flat transverse rows of scales without enlarged scales or tubercles; postmentals touch one labial; auricular opening distinctly denticulate; enlarged scales of front face of femur encroaching on dorsal surface with one to three larger tubercular scales bordering them; dorsal and posterior faces of femur granular.

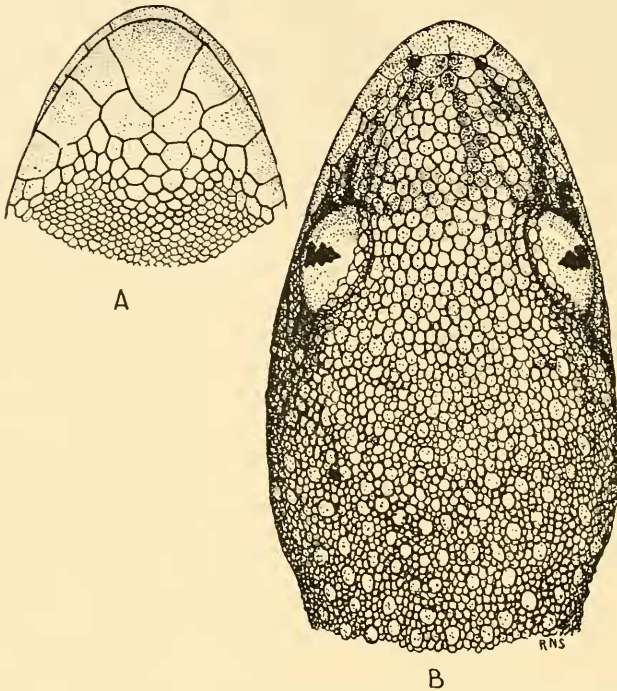


FIG. 1. *Phyllodactylus bordai* sp. nov. Type EHT-HMS No. 27732. A. Chinshields; B. Dorsal view of head. Both enlarged.

Description of type.—Head not greatly flattened, somewhat wedge-shaped; neck constricted; a slight constriction in outline of head below eye; loreal region inflated, the edge of the upper jaw somewhat shelflike; none or only a very slight depression behind the nostril; a shallow depression in the interorbital and frontal regions; rostral about once and a half as wide as high with a Y-shaped median groove entering above; nostril surrounded by the rostral, first labial, two postnasals and an internasal; latter large, about as wide as long, in contact with its fellow, but partially separated posteriorly by a median scale; seven upper labials to below middle of pupil, these followed by five very small poorly differentiated scales; five lower labials to below pupil followed by a small differentiated labial and three undifferentiated scales; fifteen scales between middle of orbits, eleven between anterior corner of orbits; three or four small rows of granules and an outer series of palpebral scales that grow smaller posteriorly; posterior scales of the series bordering lid pointed, but not spinelike; twenty-two scales across snout between

fourth labials, eighteen between third labials across snout; scales bordering labials flat and somewhat imbricate; eye moderate, its diameter contained in snout length slightly more than one and one-half times; auricular opening small, denticulate; in occipital region the scales are about the size of the interorbital scales, intermixed with a few smaller granules; mental subtriangular, the anterior curving labial edge greater than that of the rostral; postmentals in contact narrowly, touching two labials and followed by six scales; body granular above with fourteen to sixteen irregular rows of trihedral tubercles, of which eight or ten extend on the neck and eight reach base of tail; about thirty rows of scales cover the abdomen, turning up slightly at the ventrolateral edge.

Upper arm with flat imbricating scales on anterior and dorsal surfaces; granular on posterior and ventral surfaces; forearm with flat imbricating scales on anterodorsal face, granular with numerous enlarged trihedral tubercles dorsally. On ventral and anterior surfaces of femur, large imbricate scales which encroach on the dorsal surface and three of the scales of the outer row are enlarged tubercles; posterior part of femur granular; dorsal surface of lower part of leg granular with three irregular longitudinal rows of tubercles.

The lamellar formula for hand, 7-9-10-11-9; for foot 7-10-12-13-12; many of the lamella (two or more on each digit) are divided, sometimes in three, sometimes in two, parts; terminal lamella pads are longer than broad, the outer anterior edges somewhat rounded; four lateral postanal tubercles.

Tail (from EHT-HMS Nos. 21808, 10997) indistinctly annulated, the scales arranged in transverse series, their edges rounding or truncate posteriorly; fifty-four broad scales under tail.

Color.—Above grayish with narrow, irregular, transverse lighter lines (about nine from head to base of tail); an indistinct line from tip of snout through eye with other dim markings on snout, and a whitish spot in front of orbit; below white, with a fine peppering of dark pigment; digits banded dark and light; tail with eight dark bands.

Measurements in mm.—Snout to vent, 44; width of head, 9; length of head, 13; arm, 13; leg, 17; axilla to groin, 23.

Remarks.—This species was collected first in 1936 and recognized as new. The single specimen taken at that time was very young, measuring about 27 millimeters snout to vent, and having a total length of 55 mm. Believing that it would be an easy matter to obtain other specimens, I visited this region in 1938, but no specimens

were found. In 1939 a single specimen was taken from under loose bark on a tree, this only slightly larger than the first; again in 1940 the general region was visited but no specimens were found; but in 1941 somewhat north of Taxco, two specimens were obtained from under limestone rocks superimposed on other limestone rocks. These also were juveniles.

The hills in the type locality are covered with limestone which juts above the surface in innumerable places appearing as separate masses or isolated boulders. These often have small cavities where the rock has been dissolved away, leaving excellent hiding places for the lizards that are practically inaccessible to the collector. It is probable that the species is plentiful in the region.

I do not know the adult size of this species, but suspect it to be about that of *Phyllodactylus muralis* (snout to vent, 60 mm.). It differs from that form in the absence of the enlarged tubercles on the tail, larger scales between orbits (13-16, as compared with 22-26 in *muralis*), and the presence of denticulate scales in the small auricular opening. Most of the other species, in Guerrero, have whorls of enlarged tubercles on the tail; *P. lanei* has the dorsal part of femur granular with large conical tubercles scattered on the dorsal femoral surface. There are about the same number of interorbital scales in the two forms. *P. magnus* has nearly double the number of scales on the head as *P. bordai*, smaller series of ventral scales and whorls of caudal tubercles. It differs from *P. magnatuberculatus* in much the same way it differs from *P. lanei*. From *delcampi* it differs in color and markings; it agrees in the absence of caudal tubercles but has larger dorsal tubercles and is a much smaller species. The elevation at which this species has been taken (5,000-6,000 ft.) is greater than that for other Mexican species.

The species is named for Joseph le Borde (or Borda), the fabulously wealthy silver miner of Taxco.

Phyllodactylus unctus (Cope)

(Fig. 2)

Cope (1863) described *Diplodactylus unctus* from a specimen (USNM No. 5304) sent to the Smithsonian Institute by John Xantus. The type locality is Cape St. Lucas, Lower California. The original measurements given are: length from end of muzzle to auricular meatus, 12" [lines]; from the same point to vent, 4.5" [inches]. These measurements were given in a later work (Cope, 1900) as 25 mm. and 110 mm., respectively, which, if correct, are of a species

larger than any North American form known today. Most of the collected specimens referred to this species are small.

Van Denburgh (1912, p. 417) states concerning *P. unctus*, "The natives do not distinguish this from the larger *P. tuberculosus*, but on account of its small size call it *Salamanquesa chiquita*."

Two specimens from "Isla Ballena near Espiritu Santo"; Baja California, which I have been permitted to examine through the courtesy of Mr. Karl P. Schmidt of the Field Museum, are likewise small, but obviously adult. In consequence I suspected some error in the measurements. Dr. Doris Cochran, to whom I wrote requesting data on the type and submitting a drawing of an Isla Ballena specimen, supplied the following information:

"The type of *Phyllodactylus unctus* (Cope) is [USNM] No. 5304. From snout to anterior ear it measures 7.5 mm.; snout to vent, 29 mm. The top of our type's head is quite similar to your drawing. Our type has five upper and five lower labials before they become small and beadlike; yours taper off less soon. The chinshields are not similar, as you can see by my sketch of the type. The hind leg and posterior dorsal region seems similar."

The species most closely resembling *Phyllodactylus unctus* in squamation is *Phyllodactylus leei* from Chatham Island, Galápagos Islands. That species lacks enlarged tubercles among the granular body scales as does *P. unctus*. The two forms may be distinguished from each other by the presence in *unctus* of large postmentals touching each other and in contact with two labials (in *leei*, small postmentals touch one labial and are in contact or not); in *unctus* the scales under tail are broader and there is a smaller number of scales in a whorl around tail; the internasals are larger and in contact (smaller and separated frequently in *leei*); the scales on the head are smaller and more numerous in *P. unctus*, while the body scales are a little larger.

Despite the apparent similarity, it is highly probable that *P. unctus* is derived from a mainland species and is not directly related to the Chatham Island species. I believe the relationship to be with the group of small species that includes *P. muralis* and *P. bordai*. The probable relationship might be expressed, *muralis* — *bordai* — ? — *unctus*.

P. bordai appears to have lost the enlarged caudal tubercles entirely while the smaller caudal scales in the three species are very similar. In *delcampi* the enlarged caudal tubercles are missing and the enlarged dorsal tubercles are much reduced in size.

The figure given by Cope of the underside of the chin of a Triunfo, Baja California specimen (1900, *loc. cit.*, p. 461), shows three postmentals in contact with the mental, which is the more frequent arrangement in *P. leei* according to Van Denburgh (1912, p. 417).

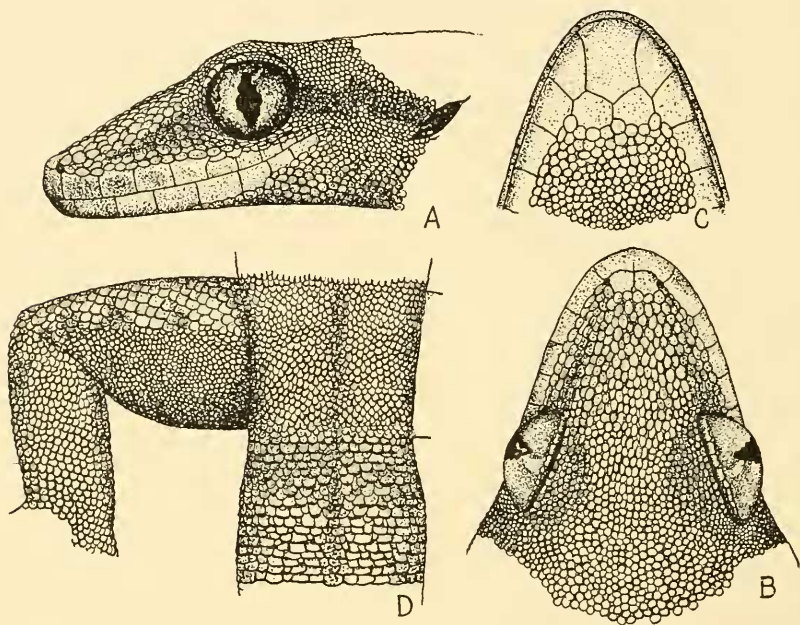


FIG. 2. *Phyllodactylus unctus* (Cope) Field Museum No. 16104. A. Lateral view of head; B. Dorsal view of head; C. Chinshields; D. Squamation of basal caudal region and hind limb. All enlarged.

The figures given for this form (Field No. 16104 snout to vent, 35 mm.) are slightly diagrammatic, but show most of the characters of the form. The following characters obtain: About 83 scale rows surrounding the middle of body, of which some 31 may be regarded as ventrals, although those on the outer edges of venter are small and merge gradually into the smaller dorsals; subcaudals widened, those near base are alternately single and paired for first 12 scales. Lamellar formula for fingers, 7-8-10-12-9; two or three distal lamellae are paired or divided into three parts. Lamellar formula for toes, 7-8-9-12-11; part of the distal lamellae are divided as in the fingers; ear lacking distinct denticulations; 21 scales between middle of orbits, 12 scales between anterior part of orbits ignoring the minute granules near eye; 28 scales between fourth labials, 19 between third labials across snout; annuli on tail consist of four, rarely five, rows

of scales above, while below there are but 2 medially and these bordered by three scales. The enlarged scales of the front face of femur cover half of the dorsal surface. Outer posterior palpebral scales each tipped with a small dermal spine.

Most of the other scale characters are indicated in the figures.

The body has five rather broad transverse bands of brown; the tail has twelve, which are narrower than the intervening light spaces; digits spotted or banded with brown.

Phyllodactylus magnus sp. nov.

(Fig. 3)

Type.—EHT-HMS No. 21783, collected at Tierra Colorada, Guerrero, September 2, 1939, by Edward H. Taylor.

Paratypes.—EHT-HMS Nos. 11047-11049, Garrapatas, Guerrero; 21765-21767, El Ocotito, Guerrero; 21768-21771, 21784-21786, Tierra Colorada, Guerrero; 11038-11044, Agua del Obispo, Guerrero; 11035, Tonolá, Chiapas; USNM, Nos. 115707-115712, Tehuántepec, Oaxaca; 115740-115750, Cajon de Piedra, Oaxaca; 115738-115739, Escurana, Oaxaca; 115713-115717, 115718-115724, 115760, Tres Cruces, Oaxaca; 115725-115737, 115703-115705 Cerro Arrenal, Oaxaca; 115751-115756 Tonolá Chiapas.

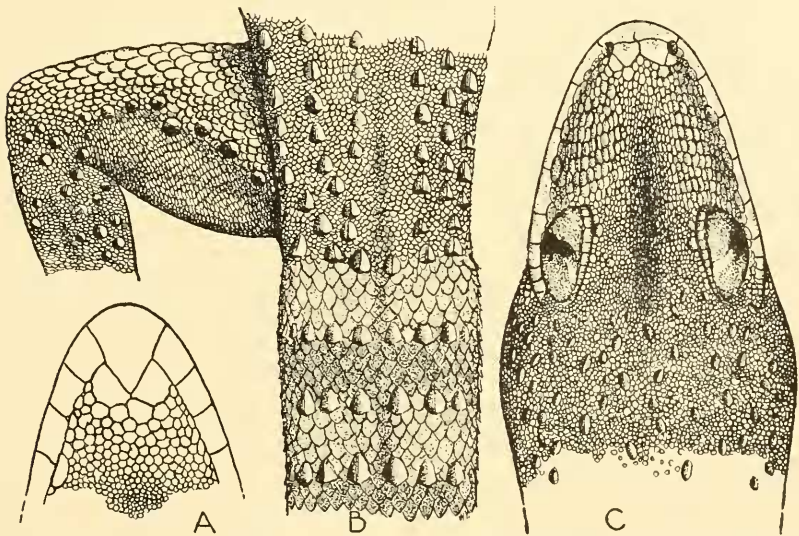


FIG. 3. *Phyllodactylus magnus* sp. nov. EHT-HMS No. 11035; Paratype Tonolá, Chiapas. A. Chin scales; B. Basal caudal region and hind limb; C. Dorsal view of head. All enlarged.

Diagnosis.—A large species, maximum snout to vent measurement about 90; ventral surfaces brilliant canary yellow; 14-16 rows of dorsal tubercles, none in contact; 25-30 scales between middle of orbits, not counting 4-5 rows on each eyelid; large flat imbricating scales on anterior face of femoral region encroaching strongly on dorsal surface, with a few elevated scales or trihedral tubercles along the posterior edge of flat scales; basal annuli of tail with transverse series of six large keeled scales separated by about four irregular rows of small scales; 28-32 scales across snout between fourth labials; postmentals large, normally touching two labials, followed usually by six or seven scales; subdigital lamellae dark, single except for a distal pair preceding the terminal pads; auricular opening not denticulate.

Description of the type.—Head flattened, bluntly wedge-shaped viewed from the side; head widened behind eyes, equaling or exceeding body width; a slight constriction in outline of head below posterior corner of eye, seen from above; loreal region slightly inflated with a slight depression immediately in front of orbit, and another behind nostril; frontal and interorbital region with a wide shallow depression; a slight groove between the internasals; twenty-nine tubercular scales between orbits with two or three larger tubercles on outer edge; four or five small granular series on eyelid with a series of larger palpebral scales, growing smaller posteriorly; scales on outer face of lid becoming pointed posteriorly; at least one or two rows on under side of the eyelid; the occipital region covered with small granules intermingled with larger tubercles somewhat bluntly conical; snout covered with large, thick, convex scales about thirty-three across the snout between fourth labials, twenty-eight between the third labials; about fourteen scales in a row between the orbit and the nostril; rostral a little more than twice as wide as high with a straight groove entering from upper edge, half as wide as the scale; two large internasals separated by small scales (in most specimens the internasals are in contact), each entering nostril as does the rostral; two postnasals, the upper largest, and the first labial also borders nostril; about fifteen upper labials, diminishing in size from the first which is as high as wide; six labials to below eye pupil, the last labials not differentiated from body scales; ten lower labials, first two higher than wide, five anterior to a point below pupil; the three following of equal size, the last two somewhat conical; mental five-sided, longer than wide, the sides bordering labials concave, the convex, curving, labial edge much greater than the rostral edge; a

pair of postmentals in contact medially, touching two labials laterally and followed by seven scales, the median largest (a portion of the second labial is partially segmented on the right side, and a corner is segmented in two pieces from the other); the mental, pointed behind, extends farther back than first labials; eleven in the second row, sixteen in third; sixty-seven scales across throat between ears.

Back with fourteen rows of trihedral tubercles among the small granular scales, the inner rows regular, the outer ones irregular; two or three small tubercles, low on side, suggest the beginning of two more rows (frequently sixteen rows present); 26-28 rows of flat imbricate scales across the belly, the outermost separated from lateral tubercles by three or four rows of granules; sixty rows from anterior level of arm to anus; posterior edge of ventral scales indistinctly denticulate; three or four small lateral postanal scales; leg reaches beyond elbow of adpressed arm; upper arm almost covered with large flat imbricated scales, with a few granules on posterior side; a few granules on upper surface of forearm with larger tubercles intermingled; large flat scales cover ventral and anterior face of thigh and encroach on the dorsal surface; a few trihedral tubercles border the larger scales; posterior face of thigh granular. Tail annulate, each annulus consisting of a series of enlarged keeled scales, and four or five other rows of small irregular scales rounded or pointed behind; distal part of tail regenerated, the scales very irregular, lacking tubercles; under surface of tail with broad plates of two types which alternate, one narrower but longer transversely, the other wider and shorter transversely; the adjoining scale row on each side irregular; two equal scales alternate with one somewhat smaller and set somewhat out of the row; lamellar formula: 6, 9, 12, 12, 10; only the distal lamella divided; a pair of large lamellar plates at tip of digits, the outer anterior edges of which are rather angular; lamellar formula for toes: 8, 10, 12, 13, 12; only the distal lamella divided; terminal pads similar to those on fingers. Claws largely concealed.

Color.—Above brownish-gray with indistinct, irregular, paired, black spots about ten from head to base of tail; a few other indefinite dark specks on head and sides of body; tail indistinctly banded at base, the regenerated part bluish-gray with some irregular lighter marks; ventral surface bright lemon yellow; lamella and terminal pads dark gray, a slight peppering of dark pigment on venter; lips with darker and lighter spots.

Table of measurements and scale counts of *Phyllodactylus magnus* sp. nov.

Number	21783	11047	11048	11049	21765	21766	21767	21768	21769	21770	21771	21784	21785	21786	11038	11039	11042	11043	11044	11035
Sex	♂	♂	♂	♀	♀	♀	♂	♂	vg.	♂	♂	♀	♀	♀	♀	♂	♀	♂	♀	♀
Snout to vent	86	79	67	71.5	82	71	71	88	41	80	86	82	83	79	66	89.5	81	43	71	81
Snout to orbit	9.8	9.1	8	8.1	9.7	8	8.1	10	5.5	8.7	10.9	9	9	9.2	8	10.1	9.1	5.1	8	9
Snout to ear	21.3	20	16.5	18	21.5	17.6	18.3	22.6	11	21	22	20	20	20	17.4	21.5	20	12	18.5	20
Snout to foreleg	34	31	25.2	31	31	30	29	35	19	34	33	31	32	32	26	32	32.2	20	27.5	32
Axilla to groin	38	38.1	32	37.5	38	32	31	42	17.5	38	42	40	41	38	32.8	40.5	37	23	33	38
Width of head	19	16	14.1	15.2	17.2	14.3	14	19	9	17	17	16.5	17	17	14	17	17	10	14	17
Length of head	24	23.2	20.3	22	25	20.3	20.4	24	12.2	23	23.5	22	23	22.5	20.5	26	24	14	22	22
Arm	26	25	22	26	22.5	22	23	28	13	24	26.3	25	25.5	24	22.5	28	27.6	15	22.5	24
Leg	35	33	28.5	33	34.5	26	30	36.5	15.5	31	37	31	32	34	29.5	38.6	32.5	18.2	32	30
Scales between orbits	29	26	28	26	26	27	26	25	28	28	26	25	26	26	27	21*	23	24	28	28
Scales across abdomen	28	28	27	24	25	26	26	26	25	26	28	25	26	25	23	24	26	24	27	27
Postmentals touch labials	2-2	2-1	2-2	2-2	2-2	2-2	1-1	2-2	2-2	2-2	2-2	2-2	2-2	2-2	2-2	2-2	1-1	2-2	2-2	1-1
Scales follow postmentals	7	9	7	9	7	7	8	6	6	6	7	8	6	6	7	7	8	7	6	8
Scales between fourth labials	33	32	32	31	33	29	29	30	28	30	30	30	28	30	29	33	31	31	38	33
Rows of tubercles	7-7	7-7	7-7	7-7	7-7	7-7	8-8	7-7	?	7-7	8-7	7-8	7-8	7-7	8-8	7-8	7-7	7-7	8-8	8-8
Scales orbit to nostril	14	13	15	14	14	13	13	12	12	12	12	13	12	12	14	13	13	12	14	14

* Injured and scales regenerated.

Variation.—The major variations in squamation are indicated in the table. Males have somewhat larger and heavier tubercular scales on the back and the tails are thicker at the base. In the series of specimens available several of the males have the dark spots a little larger than in type and they seem to contact others, suggesting a reticulum. Three of the specimens have the internasals separated by small intercalated scales. Two or three specimens had some of the lighter scales reddish-brown. The yellow color of venter is characteristic of the species and is always present save in very young specimens. One specimen from the pine region near Agua del Obispo has the median spots elongated and in a linear arrangement.

The specimens from various localities in Oaxaca and Chiapas show some variations not observable in those from Guerrero. There is some tendency to reduce the number of the enlarged caudal tubercles posteriorly. In one or two specimens the smaller caudal scales were somewhat truncate rather than pointed and arranged in somewhat straighter transverse rows. Specimens having heavier spots tending to form a body reticulum were present also in the Oaxaca and Chiapas specimens.

Compared with *Phyllodactylus lanei* from the same region this species differs in having a much larger series of interorbital scales, 23-29, average, 25.7 as compared with 14-19 with an average of about 15.7; scales across the abdomen are about 26 on the average in *magnus*, while those of *lanei* average about 30; usually the subdigital lamellae (except the outer one) are undivided, in *lanei* usually three to five are divided in two or three parts; the upper dorsal part of leg is partly covered with large, flat, imbricate scales, with a few tubercles bordering the larger scales, in *lanei* the dorsal surface of the leg is granular with eight or more scattered large, conical tubercles. The ventral surface is flesh to white in *lanei*. The three large species, *P. lanei*, *P. magnus*, and *P. delcampi*, are not closely related. They occupy the same habitats. I have found *lanei* and *magnus* in the same crevice while *magnus* and *delcampi* have been taken in the same pile of boulders. No specimens of *Phyllodactylus lanei* have been taken in the state of Oaxaca to my knowledge.

Phyllodactylus darwini sp. nov.

(Fig. 4)

Phyllodactylus tuberculosus Cope, Proc. U. S. Nat. Mus., XII, 1889 (Feb. 5, 1890), p. 145, Chatham Is. USNM Nos. 14949, 14956; Garman, Bull. Essex Inst., XXIV, 1892, p. 9 (Chatham I; "This identification may yet be questioned. The specimen in the collection, from Chatham, is badly mutilated"); Heller, Proc. Washington Acad. Sci., V, Feb. 26, 1903, p. 40 (Data on specimens mentioned by Cope *loc. cit.*); Van Denburgh, Proc. California Acad. Sci., Ser. 4, 1, Apr. 16, 1912, pp. 412-413 (21 specimens from Chatham I, No. 10848 described).

Type.—California Academy of Science No. 10848, coll. Chatham Island, Galápagos Islands, by Joseph R. Slevin, Jan. 27, 1906.

Paratypes.—C. A. S. Nos. 9909-9913, 9915, 10021, 10024, 10025, 10032, 10838-10840, 10866-10868, 10877, 10995, 11013, 11992, 11954 topotypes; USNM Nos. 14949, 14956. Topotypes.

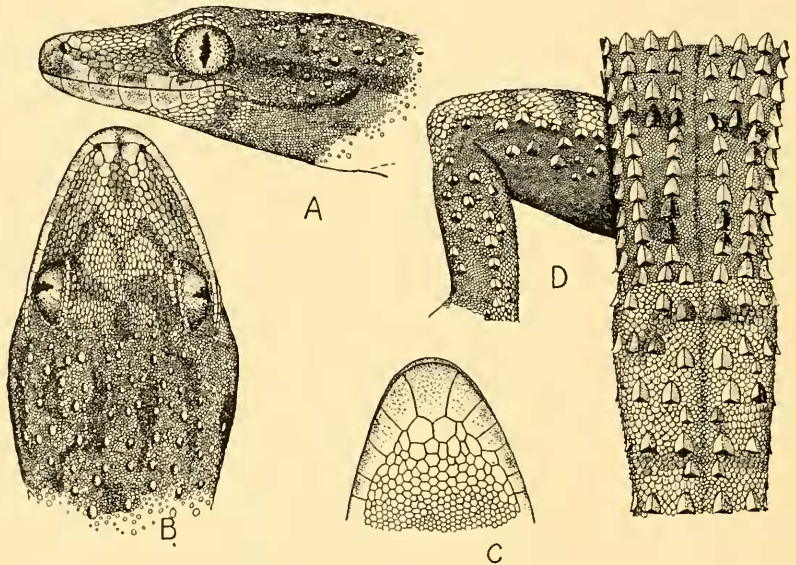


FIG. 4. *Phyllodactylus darwini* sp. nov. Type California Academy of Science No. 10848, Chatham Id. Galapagos Islands. A. Lateral view of head; B. Dorsal view of head; C. Chin scales; D. Basal caudal region and hind leg. All enlarged.

Diagnosis.—A medium-sized species of the genus; the known maximum size, 72 mm. snout to vent; 12-14 rows of large trihedral tubercles, those of the rows posteriorly usually in contact, while those farther forward separated by one or more scales; 93 to 105 granules across head between ears; scales across snout between fourth labials 23-28; mental large, bordered by two postmentals; tail with whorls of enlarged trihedral tubercles, which are separated by several irregular transverse rows of small granules. Usually a pair of trihedral

tubercles between the whorls, occasionally four such scales; irregular scales between orbits. Ventral and ventrolateral scales not well differentiated.

Description of the type.—Head moderately flat, bluntly wedge-shaped viewed from the side; head distinct from neck which is somewhat constricted; none or only a slight constriction in outline of head below eyes; loreal region somewhat inflated save for a slight depression anterior to lower part of eye, and a slight depression posterior to the nostril; anterior part of interorbital region and frontal region slightly concave; interorbital scales between middle of eyes 18-20, outermost row with three or four enlarged tubercles; fourteen enlarged scales between anterior part of orbits not counting granular scales; eyelids folding back under the supraorbital region, covered above with three to four rows of granules and bordered by a row of large scales diminishing in size posteriorly; the scales of row on outer edge of lid are somewhat pointed or spinose posteriorly; two rows of scales on the front and under surface of the lid; ten or eleven larger scales between orbital depression and nostril; scales bordering upper labial slightly imbricate posteriorly; about twenty-three scales between third labials, twenty-six between fourth labials, across the snout. Rostral much more than twice as wide as high, with a Y-shaped groove entering from above; a pair of internasals; two postnasals behind nostril; nostril bordered by these four scales and the first labial; six or seven labials diminishing in size to a point directly below middle of eye, followed by two or three smaller labials which are not strongly differentiated from body scales, and five as small as body scales; edges of snout not flattened out forming a shelf; five or six lower labials to a point below eye, diminishing in size posteriorly; behind these there are two larger and four very small scales; mental large, subpentagonal, bordered by a pair of postmentals which touch each other and only a single labial; mental border of lip distinctly larger than rostral border; a row of six irregular scales border the postmentals, the outermost touch first and second labials; forty-six scales between jaws at level of eye, those bordering the labials, largest.

A few small, low conical tubercles begin on the occipital region, becoming larger in parietal and temporal region; on neck begin six rows of trihedral tubercles forming twelve rows at middle of body with a few scattered tubercles outside these; outer tubercles on posterior part of back heavy, distinctly larger than the median rows; between hind legs there are eight rows anteriorly, becoming six pos-

teriorly, scales in the outer rows are usually in contact antero-posteriorly, separated by from one to three minute scales laterally; the median rows of tubercles are separated by twelve to fourteen minute scales between hind legs. The ventral scales are moderately large, not strongly differentiated from the lateral scales at ventrolateral region of midbody; those on sides smaller but they diminish gradually in size and the scales are less flattened, about forty between the outermost laterally enlarged tubercles; across breast they are better differentiated and here there are about thirty-two ventral scales. No ventrolateral fold; nor can a ventrolateral glandular region be distinguished.

Tail longer than head and body, annulated, sixty-three scales (or pairs of large scales) under tail; beginning at the base, scales alternately narrower, with greater transverse length, and wider with a lesser transverse length; this difference in shape increases, the narrower (longitudinal) scales becoming somewhat bilobed; later these are replaced by paired scales alternating with the unpaired ones and at tip all are paired; there are two of the large scales to an annulus, the medial series bordered by a series of large scales in which two scales of equal size alternate with a smaller scale, this arrangement not so obvious at the tip; each annulus above covered with three or four transverse rows of small scales and a transverse row of six or eight enlarged trihedral tubercles, the median scales largest; between these rows are medial pairs of trihedral tubercles at first equally spaced, then set closer to the following row; farther back there may be four or six larger scales in the intercalated rows; lateral caudal scales less elevated than dorsals.

Limbs of moderate length, the adpressed leg reaching beyond elbow of the adpressed arm; anterodorsal surface of arm with equal flat imbricating scales; scales equal but much smaller and granular on under surface; forearm anteriorly with flat scales, dorsally with a patch of granules intermixed with large trihedral tubercles; under surface of forearm with scales larger than those on under surface of upper arm. Lamellar formula for hand: 7, 10, 12, 12, 9; the distal scales forming a pair of lamella, and the one adjoining this is divided on first three fingers into two or three parts; lamellar formula for toes: 8, 12, 13, 13, 12; distal lamella divided; on second and third toes, the one or two adjoining lamellae also divided; large terminal flaps (not counted) divided medially, their outer, lateral, anterior edges somewhat rounding; claws largely concealed; ventral surface of leg and the anterodorsal face of femur covered with flat imbricate

scales; posterior and posterodorsal parts covered with granules intermixed with enlarged trihedral tubercles.

Eye large, the pupil a vertical slit with irregular edges. The auricular opening a diagonal slit, lined with slightly enlarged scales. On the posterior part of many scales on body and tail there is a slight or distinct denticulated posterior edge. A small smooth upper anal flap, the edge scarcely free, a row of three or four small lateral post-anal scales; openings of cloacal pores visible.

Color.—Dorsal surface yellowish gray, with a somewhat regular series of brown spots or lines on head; the brown markings on back tend to form a reticulum; legs and arms dimly reticulated; a dark stripe from snout to eye, and from eye to above ear, above which there is an indistinct lighter stripe; labials with brown spots; thirteen darker bars on tail; below yellowish white with a slight peppering of brown pigment.

Measurements in mm.—Nos. 10995, 10848, respectively: sex, ♂, ♀; snout to vent, 72, 61.5; snout to eye, 8.2, 8; snout to ear, 18.6, 15.5; snout to arm, 30, 23.8; axilla to groin, 34, 26; tail, ?, 70; arm, 22.5, 22; leg, 30.5, 27.5; width of toes, 1.8, 1.8; diameter of orbit, 3.7, 3.5; rows of tubercles, 14, 13; scales between ears, 102, 93; scales between orbits, 17, 20; scales across snout between fourth labial, 28, 26.

Variation.—Van Denburgh (1912) gives some data on the variations occurring in this species. There is some difference in the elevation of the dorsal tubercles which may be due to age. Some of the median dorsal tubercles have more conspicuous dorsal keels and appear much smaller than outer scales.

Remarks.—When this species is compared with *Phyllodactylus lanei* of the same size the following differences are evident in the latter. The mental is much larger, less emarginate laterally, and extending farther back; the enlarged postmentals are in contact usually with two labials; the toes are broader and the posterior dorsal tubercles are not contiguous; the granules on back of femur are nearly twice the size of those in *darwini*; scales on the tail are larger, flatter, while the trihedral tubercles are arranged in simple transverse series usually of six scales; the lateral glandular folds are very prominent and the dorsal markings are pair quadrangular brown spots.

Compared with tuberculated species of *Phyllodactylus* from Baja California and adjacent islands, the following differences obtain: The mental is smaller, narrower, not extending so far back; the ear opening is smaller, of different shape, and has denticulations; enlarged scales present between the transverse tubercular rows on tail.

Other differences are obvious on a comparison of specimens or descriptions.

The species is named for Charles Darwin, a traveller who once visited the Galápagos Islands.

Phyllodactylus ventralis O'Shaughnessy

(Fig. 5)

Phyllodactylus ventralis O'Shaughnessy, Ann. Mag. Nat. Hist., (4), 16, 1875, p. 262. (Type description; type locality, Jamaica [probably in error].)

This very poorly described species has been reported from Jamaica (doubtful type locality), Colombia and Nicaragua. O'Shaughnessy compared the form with *Phyllodactylus tuberculosus*, but what he interpreted as *P. tuberculosus* is not known.

Two specimens belonging to the U. S. National Museum (Nos. 89480-89481) were collected on the aviation field at Managua, Nicaragua. They have been dried somewhat and some of the characters have been made out with difficulty. Probably because of their condition they had been mistakenly referred to *P. tuberculosus*.

The major characteristics of one of these specimens is given in the somewhat diagrammatic figure. The part of the tail figured is regenerated.

The following characters obtain in USNM No. 49480, Managua, Nicaragua: Groove in rostral straight, not Y-shaped; scales between posterior parts of third labials across snout, 21; between middle of orbits, not counting scales on eyelids, 16; scales between orbits nearly as large as those on the snout; on parietal region, large, moderately elevated, conical tubercles with some smaller tubercles between; about 40 large and small tubercles between auricular openings across occipital region; auricular openings not denticulate, probably somewhat curving in life or slightly triangular, rather vertically placed; about 13 to 15 scales between ear and orbit; 10 to 11 between orbit and nostril; the usual 5 scales surround nostril; 5 upper labials to below pupil; the labials low, elongate, about twice as long as high, five lower labials to same point; mental bell-shaped, reaching back as far as first labials, followed by two postmentals about as large as first labials; these followed by four scales in first row and ten in second row; 12 to 14 rows of dorsal tubercles which are nearly as wide as long on back; the rows are irregular and there is no widened median area without tubercles; upper arm and forearm with large imbricating scales, those of the latter smaller; dorsal surface of hind leg with cycloid imbricating scales without tubercles;

lamellar formula for hand: 7, 8, 10, 11, 8; for foot: 7, 9, 10, 12, 10, occasionally one of the proximal lamellae is divided; of the distal lamellae, the one just following the divided terminal pad, is paired; about 22 to 24 enlarged scale rows across venter; about 51 transverse rows from neck to anus. About 48 scales across throat between lower part of auricular openings; four lateral postanal tubercles on each side. The tail is regenerated in this specimen.

The smaller specimen has the original tail, but this is shriveled. The scutes are large, arranged in annuli consisting of a row of larger scales and two or three smaller rows; scales under tail, large, not paired, two to each annulus; the keels on the dorsal scales are indistinct in the dried specimens.

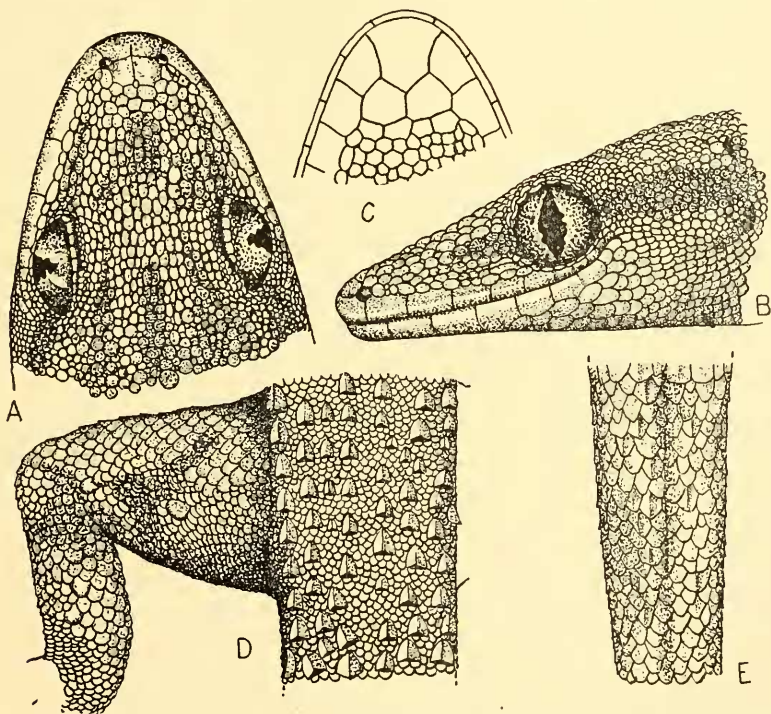


FIG. 5. *Phyllodactylus ventralis* O'Shaughnessy. U. S. Nat. Mus. No. 89480, Managua, Nicaragua. A. Dorsal view of head; B. Lateral view of head; C. Chinshields; E. Portion of tail (regenerated). All enlarged.

Phyllodactylus reissi Peters

(Fig. 6)

Phyllodactylus reissi Peters, Monatsb. Königl. Akad. Wiss. Berlin, Nov., 1862, pp. 626-627. (Type description; type locality, Guayaquil, Ecuador.)

The literature on this species other than the type description consists of very few references. It has recently been suggested that the type locality is incorrect. The probabilities are, however, that it is correct.

I am referring a specimen in the U. S. National Museum, No. 12354 from Guayaquil, Ecuador, (catalogued as *Phyllodactylus tuberculosus*) to this species. I have not examined the type, but this specimen agrees rather well with the very few scale characters given in the type description. The enlarged tubercles on the back are not broader (or but occasionally so) than the intervening granular spaces between them. They appear to the naked eye actually narrower. The mental is almost wholly between the adjoining infralabials and followed by two rounding (actually, nearly hexagonal) scales; there are 14 longitudinal rows of closely approximated tubercles on the back, the rows regular. The scales in the occipital region at least in the middle part are without enlarged tubercles. However, there are a few slightly enlarged ones on the sides of the back of the head, all, however, smaller than the scales on the snout. The specimen is so faded that I cannot say whether the markings are the same as those of the type, but presume that originally they were the same.

The following characters obtain in USNM No. 12354: Rostral much wider than high, with a straight median groove entering from the posterior edge, followed by two enlarged scutes which are separated medially by two small scales; nostril surrounded by five scales, the two postnasals somewhat larger than adjoining scales of the snout; about 28 scales between the fourth labials across snout; snout scales somewhat oval, slightly elevated laterally but flattened medially; 12 to 14 scales between orbit and nostril; about 26 scales between middle of orbits not counting scales on eyelids; scales on sides of back of head with a few slightly enlarged tubercles; about 65 granules between the auricular openings across the head; ear more vertical than horizontal, surrounded by sharp denticulate scales; seven or eight upper labials to a point below pupil; seven lower labials to the same point; mental slightly campanulate; the two median chinshields touch only the first labials and are bordered by six scales, the two outer of which likewise touch first labial, and also touch the second; about 27 longitudinal enlarged imbricate scales across the abdomen; about 55 transverse rows from a line drawn

between front part of the arms to anus; the anterior and most of the dorsal surface of arm with rather large imbricate scales; anterior face of femur and the anterior dorsal part of same with enlarged imbricate scales without any enlarged tubercles; posterior face with minute granules; a few scattered tubercles on lower part of leg. The terminal pads widened, somewhat angular, followed by a paired lamella. The two lamella that follow these may be divided in two or three parts. The remainder of the subdigital lamella, wide and undivided.

The tail is wanting so that the very important caudal characters cannot be recorded.

The figure given of this form is somewhat diagrammatic. The scales on the snout are slightly larger than depicted and a trifle more regular. The scales between the orbits are much more regular, especially those directly above the orbits. The shape of the pupil cannot be exactly determined.

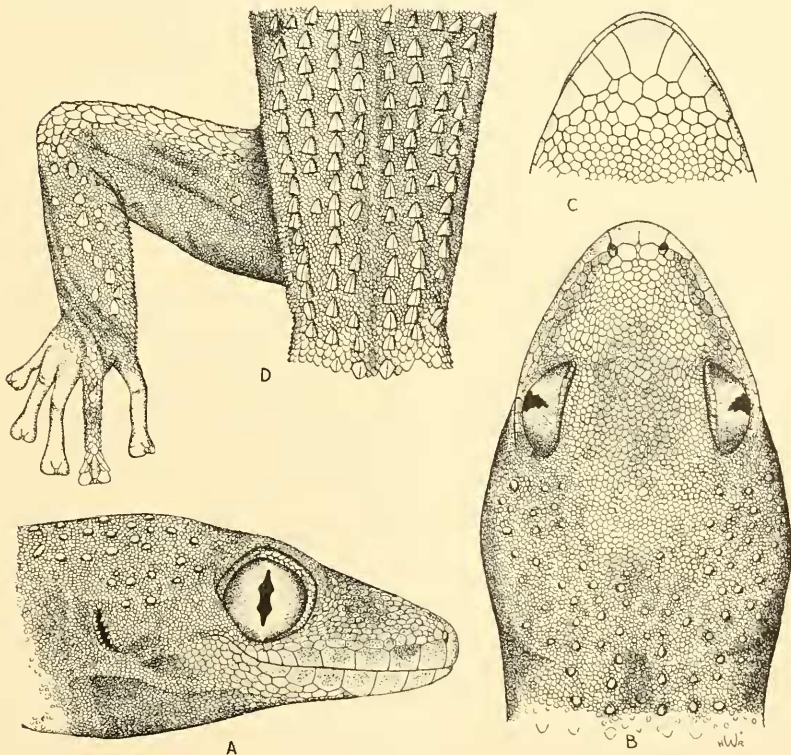


FIG. 6. *Phyllodactylus reissi* Peters. U. S. Nat. Mus. No. 12354, Guayaquil, Ecuador. A. Lateral view of head; B. Dorsal view of head; C. Chin scales; D. Posterior part of body and hind limb. All enlarged.

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